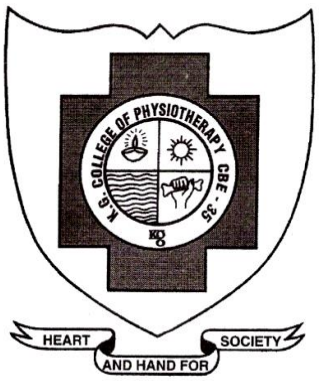
AN EXPERIMENTAL STUDY TO COMPARE THE EFFECTS OF INTENSIVE REPETITIVE FACILITATION VERSUS MODIFIED CONSTRAINT INDUCED MOVEMENT THERAPY ON MOTOR RECOVERY OF UPPER LIMB AND HAND IN STROKE PATIENTS



REGISTER NO: 271620306

ELECTIVE: PHYSIOTHERAPY IN NEUROLOGY

A DISSERTATION SUBMITTED TO THE TAMILNADU

Dr. M. G. R MEDICAL UNIVERSITY, CHENNAI.

AS PARTIAL FULFILLMENT OF THE

DEGREE OF MASTER OF PHYSIOTHERAPY

MAY 2018

CERTIFICATE

Certified that this is the bonafide work of **Ms. SINDHU SNEHITHA M** of K.G. College of Physiotherapy, Coimbatore submitted in partial fulfillment of the requirements for Master of Physiotherapy Degree course from the Tamil Nadu Dr. M. G. R Medical University under the **Registration No: 271620306** for the May 2018 Examination.

Date: Principal

Place: Coimbatore

Date:

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Under the guidance of,

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Internal examiner External examiner

ACKNOWLEDGEMENT

First of all, I thank to the **GOD** almighty, merciful and passionate, for providing me this opportunity and granting me the capability to proceed successfully.

At the very outset, I express my deepest sense of gratitude to our respected Chairman **Padmashree Dr. G. Bakthavathsalam,** Chairman K. G. Hospital, Coimbatore for allowing me to use facilities of the hospital and institution for this study.

I would like to express my deep thanks to our madam **Mrs. Vaijayanthi Mohandas,** CEO - Education, K. G. College of health sciences for her concern for the betterment of students.

I humbly express my sincere gratitude and special thanks to our Principal **Dr. B. Arun, MPT, Ph D.,** for his support, encouragement, valuable suggestions and guidance.

My special and sincere thanks to **Dr. Mohan Raj, MPT, Ph D.,** Vice Principal, for rendering valuable suggestions, constant guidance and support for the progress of my work and fruitful outcome of this study.

I take this opportunity to express my profound gratitude and deep regards to my guide **Professor .Mrs. M. ARUL PRIYA MPT,** for her exemplary guidance and constant encouragement throughout the course of this dissertation.

I express my sincere gratitude to **Prof. V. Mohan Gandhi, M.P.T.,** Chief Physiotherapist, K.G. Hospital, Coimbatore for his valuable support and guidance.

I extend my sense of gratitude to **Prof. R. K. Punitha Kumar, M.P.T.,** other **Faculty Members, Librarian** of K.G. College of Physiotherapy, and **Physiotherapists** in the Department of

Physiotherapy, K.G. Hospital for their priceless contribution in cultivating education and special skills in me which stands significant for my career.

I am obliged to offer my sincere thanks to all **my subjects** for having consented to participate in this study forgoing all suffering.

My deep humble sense of gratitude to **My Father, Mother, and brother** for their unwarranted and unconditional love and courage they have given me.

Last but not least, I extend my thanks to **My Friends** for their unwavering support, encouragement and love which helped me in doing my project and my studies as well.

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I INTRODUCTION

According to WORLD HEALTH ORGANISATION Stroke is a clinical syndrome consisting of rapidly developing clinical signs of local or global disturbances of cerebral functions lasting more than 24 hours or leading to death with no apparent cause other than vascular origin. Stroke is one of the leading cause of death and disability in India. The estimated adjusted prevalence rate of stroke ranges from 84-262/1, 00,000 in urban areas. The incidence rate is 119-145/1, 00,000 based on a population study in Tamil Nadu (Jeyaraj Duraipandiyan et.al. 2013).

Stroke is broadly classified as ischemic or hemorrhagic. Ischemic stroke is due to the occlusion of a cerebral vessel. Closely allied with ischemic stroke is transient ischemic attack (TCA) a temporary neurologic deficit that is caused by a cerebrovascular disease that leaves no clinical or imaginary trace. Hemorrhagic stroke is caused due to the rupture of vessels leading to hemorrhage (Adam & Victors 2001). Middle cerebral artery is the largest cerebral artery and is the vessel most commonly affected by cerebrovascular accidents. Middle cerebral artery supplies most of the outer convex brain surface nearly are of basal ganglia, posterior and anterior internal capsule the vessels leads to a divided neurological sequel (Daniel I Salter 2017).

Symptoms of stroke includes weakness in arm or leg or both on the one side of the body ,weakness in the muscle or face, speech problem, co-ordination problem, dizziness with or without loss of consciousness (Kenneth W Lindsay 1980). Impairments or loss of gross motor skills such as sitting, standing, walking and lifting object becomes difficult. Fine motor skills such as typing writing and picking up small objects can also be impaired or completely lost. Although most patients shows significant gains in motor functions early after stroke onset, a large population still shows long term impairments of upper limb motor functions, limitations of activities and restriction in social participations after stroke(Stein J et.al. 2017).

Rehabilitation plays a vital role in improving motor control and functions in stroke patients. There are many rehabilitation protocols/techniques that is effective for improving upper extremity functions in patients with stroke. One such technique is modified constraint induced movement therapy. Constraint induced movement therapy is a massed task practice of affected limbs with shaping techniques and constraining the unaffected limb for about 90% of patients' waking hours.

Modified constraint induced movement therapy involves ipsilateral constraint of the limb with training of paretic arm use conducted by a clinician with repetitive task training and with shaping over the same time course or less intensity over several weeks (Page SJ et.al., 2004). In this study the constraint is accomplished by placing the entire arm (unaffected) in a sling and ADL task training is given.

Intensive repetitive facilitation exercise training involves the active practice of specific movements/motor activities and is a component of current approaches in stroke rehabilitation (French B et.al. 2016). The repetitive facilitation exercise consists of eight facilitation methods for upper limb and hand. In addition significant physical stimulation such as stretch reflex or skin-muscle reflex were also administrated while the patient attempts to perform activities with his affected limb. This elevates the level of excitation of corresponding injured motor tracts and it allows patient to initiate movements of hemiplegic hand or finger in response to his intention.

Hence this study tends to analyze the effect of intensive repetitive facilitatory exercise versus modified constrained induced movement therapy in improvement of motor function recovery of hemiplegic upper limb and hand in stroke patients.

1.1 NEED FOR THE STUDY

The estimated prevalence rate of stroke rage 334-424/1, 00,000 individuals in India .The incidence rate is 119-145/1, 00,000 individuals bases on population studies

Previous studies on efficiency of the neurophysiological approaches in promoting the functional recovery of upper limb in hemiplegia limited. Hence this study concentrates on the approaches that concentrates on motor functional recovery of upper limb and hand in hemiplegic individuals.

1.2 AIM OF THE STUDY

The purpose of the study is to find out the effect intensive repetitive facilitation techniques versus modified constraint induced movement therapy in the motor functional recovery of upper limb and hand following stroke.

1.3 OBJECTIVES OF THE STUDY

- To evaluate the effect of modified constraint induced movement therapy on motor functional recovery of upper limb and hand in patients with stroke.
- To evaluate the effect of intensive repetitive facilitation technique on motor functional recovery of upper limb and hand in patients with stroke.
- To compare the effect modified constraint induced movement therapy versus intensive repetitive facilitation technique on motor functional upper limb and hand in patients with stroke.

1.4 HYPOTHESIS

(a) NULL HYPOTHESIS

There is no significant improvement in the motor functional recovery of upper limb and hand between modified constraint-induced movement therapy and intensive repetitive facilitation technique in patients with stroke.

(b) ALTERNATE HYPOTHESIS

There is a significant improvement in the motor functional recovery of upper limb and hand between modified constraint-induced movement therapy and intensive repetitive facilitation technique in patients with stroke.

1.5 KEYWORDS

- Intensive repetitive facilitation technique
- Modified CIMT
- Motor function recovery of upper limb
- Motor function recovery of hand

II REVIEW OF LITERATURE

STROKE REHABILITATION

Lays et.al., (1992)

Conducted a study on prevalence and significance of hyper dense middle cerebral artery in acute stroke patients performed using CT scans within 12 hours after onset of stroke with 272 consecutive unselected patients with stroke. Concluded that 73 patients had MCA hyper dense leading to prevalence of 26.8% in whole group and 41.2% in patients with MCA infarct.

Hirofumi Nikayama et.al., (1994)

Conducted a study on compensation in recovery of upper extremity functions after stroke with 214 severely upper limb impaired patients were recovery was noted. And concluded that out of 214 patients 25 patients showed improvement in the upper limb functions and the remaining others were possible only through the compensation of the unaffected arm.

Henric Stric Jougensen (1994)

Conducted a Copenhagen study on recovery of upper limb extremity functions in stroke.421 consecutive stroke patients admitted acutely during a 1 year period and the upper limb functions were assessed using barthel index scale. Concluded that

upper limb functions should not be expected to be recovered completely after 11 weeks post stroke.

George H Kraft et.al., (1992)

Conducted a study involving 22 right hemiplegic patients for a period of 12 months and the subjects received (i) EMG (ii) low intensity electrical stimulation of wrist with voluntary contraction (iii) PNF (iv) no treatment for 3 months and the results were measured using FM post-stroke recovery pre-test and post-test test. And concluded that chronic stroke patients can achieve and maintain functional improvements especially in electrical stimulation and voluntary movements.

Kwakkar et.al., (2006)

Conducted a study on predicting improvement in the paretic upper limb after stroke with 101 patients which concludes that functional improvement of paretic upper limb is mainly determined by the improvement of the paretic hand , followed by synergetic independence co-activated that is negatively associated with upper limb functions suggestively that most pronounced improvements occur earlier after stroke.

R.N. Barked & SG Braure (2009)

Conducted a study on stroke survivors prospective of upper limb recovery after stroke with 19 survivors and o spouses. Data were analysed using principles of

grounded theory and emphasizes the needs & aspirations of stroke survivors and also that place no limits on recovery.

MODIFIED CONSTRAINT-INDUCED MOVEMENT THERAPY

Stephen Page (2009)

Conducted a study on forced use of upper limb after TBI promoting plasticity and functions through practice with the patients with TBI occurring >1 year ago. The patients were participated in 10 sessions of forced use of upper limb. Concluded that modified CIMT is a promising approach which improved more affected limb use and functions can be realized following TBI.

Edward Taub et.al., (1998)

Conducted a review on induced movement therapy constraint induced movement therapy; a new approach to treatment in physical rehabilitation stated that based on the behavioral psychology and neurophysiology that has been shown in controlled extremely in chronic stroke patients in both laboratory and real world.

Thrane G et.al., (2014)

Conducted a study on constraint induced movement therapy early after stroke improves rate of upper limb motor recovery for 47 participants who are allocated 24 into the intervention group and 23 in to the control group. Intervention group received modified CIMT and control group received standard care according to

guidelines. Concluded that modified CIMT protocol within the first 4 weeks after stroke may improve the rate of upper limb recovery compared to standard care.

Page SJ et.al., (2001)

Conducted a study to determine the feasibility and efficiency on modified constraint induced movement therapy consists of 6 patients within 2 and 6 months post stroke, 2 patients were administered an half an hour rehabilitation and occupational therapy for 3 times a week during in which the unaffected arm constraint for 90% of the individuals waking hours. 2 patients received regular rehabilitation and were the rest received no treatment. Concluded that modified CIMT May be efficacious in improving functions and use of patients exhibiting learning nonuse.

Stephen l Wolf et.al., (2006)

Conducted a study on effect of CIMT on upper extremity functions 3 to 9 months after ischemic stroke with 222 individuals. The subjects are assigned either to CIMT with shaping or usual customary care. Concluded that among patients with who had stroke within 3 to 9 months, CIMT produced statistically significant and clinically relevant improvements in arm motor functions that persisted for at least 1 year.

INTENSIVE REPETITIVE FACILITATION THERAPY

Kazumi Kawahira et.al., (2004)

Conducted a multidisciplinary study on motor recovery of the hemiplegic lower limb with addition of intensive repetitive facilitation exercises with 23 post stroke study subjects. Two week facilitation technique sessions were administered with more than 10 repetitions of a day for each 5 kinds of movements. Concluded that intensive repetition of facilitated movements improves voluntary movements of the hemiplegic lower limb in patients' brain damage.

French B et.al., (2005)

Conducted a review on repetitive task training for improving task training after stroke. Their study included 33 trials and 1853 patients. Concluded that there is a moderate quality evidence that repetitive task training improves upper and lower limb functions and the improvements were sustained up to 6 months post treatment.

Catherine butefisch (1995)

Conducted a study on repetitive training isolated movements on the outcome of motor rehabilitation of centrally paretic hand with 27 hemiperatic patients using multibaseline approach across Individuals with standard training of affected arm. Training consisted of repetitive hand and finger extension and flexion against various loads carried out twice daily during 15 minute period. Concluded that

repetition of motor activities in the centrally paretic hand and challenge conventional physiotherapy strategies that focuses on elasticity have more importance in motor rehabilitation.

Megumi shimodozono (2012)

Stated the benefits of repetitive facilitation exercise for upper extremity after subacute stroke 52 subjects with stroke related upper limb impairments and patients were randomized into 2 groups and received treatment for 4 weeks 40 mins/day. Were one group received repetitive facilitation exercise and the other group received conventional rehabilitation. Concluded that repetitive facilitation exercises are more effective in lessening the impairments and improving upper limb motor functions during subacute phase of stroke.

Wing k at.al., (2008)

Conducted a retrospective study on whole body intensive rehabilitation feasibility and effectiveness in chronic stroke survivors. Given a whole bandy intensive rehabilitation for 3-6 hours /day/week and repetitive task specific upper extremity practice and concluded that intensive repetitive training and whole body intensive training is an effective and feasible approach to promote recovery in chronic stroke survivors with moderate to severe deficit.

BRUNNSTROM RECOVERY STAGE;

Ismail Safaz at.al., (2009)

Done a study to find out whether Brunnstrom recovery scale and motricity index index were correlated with each other and sensitivity of the scale. 46 stroke individuals were selected and assessments are made immediately and on the last day if discharge and resulted that responsiveness of both scale were strong. Hence concluded that both Brunnstorm recovery scale and motricity index seem to well correlated and responsive concerning the recovery of upper extremity recovery.

B. Ylmaz et.al., (2009)

Stated that Brunnstrom recovery scale being a convenient test they may easily applied relatively and also to be applied to the follow-up during rehabilitation.

SIMPLE TESTS FOR EVALUATING HAND FUNCTIONS;

Shino K et.al., (2015)

Study conducted in order to find out the psychometric properties of the simple test for hand function examination in stroke patients .34 patients were assessed With STEF and active reach arm test were done initially and at the end if 3rd week post treatment. Concluded that STEF is reliable, valid and sensitive to changed when applied to patients with sub-acute stroke.

Leopold Recut et.al., (1990)

The validity of the STEF test is examined. It was demonstrated that healthy subjects were able to accomplish in the patients with hand impairments. It has been experimentally tested for 327 subjects with healthy hand and 63 patients with impaired hand for the validity of the test. Concluded that reliability is high In case of hand impairments for STEF test.

Keisuke et.al., (2017)

Conducted a study to evaluate the validity, reliability and responsiveness of modified STEF versus Purdue pegboard test with 40 patients. The Intra-rate and inter-rate reliability is calculated and concluded that modified STEF is a reliable measurement tool with positive correlation with Purdue pegboard test and has greater responsiveness than the Purdue pegboard test.

III METHODOLOGY

3.1. STUDY DESIGN

Two group pre-test and post-test experimental study design.

3.2. STUDY SETTING

The study was conducted in physiotherapy outpatient department, K.G. Hospital, Coimbatore.

3.3. STUDY SAMPLING

Based on selection criteria, 30 ischemic stroke subjects were selected and they were allotted into 2 groups by simple random sampling method as 15 subjects in each group.

3.4. STUDY DURATION

The study was conducted for a period of 6 months.

3.5. CRITERIA FOR SELECTION

3.5.1. INCLUSION CRITERIA

- Both the sexes were included
- Age between 35-65 years old
- Subjects with subacute MCA stroke

- ❖ Subjects with hemiplegia due to stroke
- ❖ Subjects with Brunnstrom recovery stage of 2 to 5
- ❖ Subjects with ability to understand therapists direction and communications

3.5.2. EXCLUSION CRITERIA

- ❖ Patients with loss of sensation
- ❖ Patients with hypersensitivity
- ❖ Severe hemiplegia with Brunnstrom stage of <2 in upper limb.
- ❖ Medical or neurological contraindications that limits the effects of intensive repetitive facilitation technique and modified CIMT such as
    - ✓ Severe sensory disturbance
    - ✓ Pain or contracture of upper limb
- ❖ Severe aphasia that made it impossible to follow verbal instructions of the therapist
- ❖ Dementia or visuo-spatial hemineglect that influence the outcome measure or limits the patients attention span or learning capacity
- ❖ Failure to consent to participate.

3.6. VARIABLES

3.6.1. INDEPENDENT VARIABLES

- ❖ Intensive repetitive facilitative technique
- ❖ Modified constraint induced movement therapy

3.6.2. DEPENDENT VARIABLE

- ❖ Motor functional recovery of upper limb
- ❖ Motor functional recovery of hand

3.7. OUTCOME MEASURES

- ❖ Brunnstrom recovery stage for upper limb
- ❖ Motor functional recovery of hand

3.8. PARAMETERS

- ❖ Motor function recovery

3.9. MATERIALS REQUIRED

- ❖ Arm sling
- ❖ Mugs
- ❖ Pebbles, sand & water
- ❖ Six small size cubes

- ❖ Six middle sized cubes
- ❖ Five large cuboids
- ❖ Six small balls
- ❖ Six middle sized ball
- ❖ Five large balls
- ❖ Seven circular disc
- ❖ Six wooden circular disks
- ❖ Six pins
- ❖ Six pieces of cloth

3.10. ORIENTATION OF THE SUBJECTS

Before treatment, all subjects were explained about the study and procedure to be applied and were asked to inform if they felt any discomfort during the course of the treatment. All the subjects who were interested to participate in the study were asked to sign the consent form before the treatment.

3.11. PROCEDURE

Based on the selection criteria 30 stroke subjects are selected. They were assigned into 2 groups by simple random sampling method, with 15 subjects in each group. All 30 subjects were involved for pre-test assessment for motor function recovery of upper limb

The 8 weeks treatment program was given 5 days per week, 60 minutes per session.

For both group A and group B

CONVENTIONAL THERAPY

- ✓ Active assisted range of motion to shoulder elbow wrist and fingers (10 rep each for 10 mins)
- ✓ Free exercises
- ✓ Activities of daily living

Will be given for 20 mins 5days a week.

In addition to conventional therapy

FOR GROUP A:

Modified constraint induced movement therapy were given for control group

Participants were taught to apply arm sling on the unaffected arm and encourages to do ADL activities with shaping (adaptive task training) for 40 mins a day for 5 days a week and the participants were advised to practice the task training at home.

FOR GROUP B:

Intensive repetitive exercises were given for 40 mins which includes 8 facilitation methods for hemiplegic upper limb and finger.

i. Shoulder flexion with 90 elbow flexion in supine
ii. Shoulder horizontal extension /flexion with elbow flexion in supine
iii. Shoulder flexion/adduction/external rotation with flexion of elbow and forearm accompanied by wrist flexion & shoulder extension/abduction/internal rotation while extending the elbow & pronating the forearm accompanied by wrist dorsiflexion and finger extension in supine
iv. Shoulder flexion/abduction/external rotation with elbow extension accompanied by wrist dorsiflexion and finger extension
v. Forearm supination/pronation with 90 elbow flexion in sitting position
vi. Wrist dorsiflexion and fore arm pronation with extension of fingers in supine position
vii. Finger extension with wrist flexion in supine
viii. Finger extension/flexion with wrist flexion in the sitting position

Each technique were performed of 100 repetitions for 40 mins for 5 days

3.12. STATISTICAL TOOL USED

Paired ‘t’- test

The intra group analysis of results were done with paired ‘t’ test with 5 % level of significance. Statistical analysis is done using dependent ‘t’ test

$$S = \sqrt{\frac{\sum d^2 - \frac{(\sum d)^2}{n}}{n-1}}$$

$$t = \frac{\bar{d}\sqrt{n}}{s}$$

Where,

d=difference between the pre-test Vs post-test

$\bar{d}$=mean difference

n=number of observations

s=standard deviation

To compare Group A And Group B ;

Statistical analysis is done using independent 't' test

$$S = \sqrt{\frac{\sum(x1-\overline{x1})^2+\sum(x2-\overline{x2})^2}{n1+n2-2}}$$

$$t = \frac{\overline{x1-x2}}{S}\sqrt{\frac{n1n2}{n1+n2}}$$

Where,

n1 = total number of subjects in group A

n2 = total number of subjects in group B

$x1$ = difference between pretest Vs posttest of group A

$\overline{x1}$ = mean difference between pretest Vs posttest of group A

$x2$ = difference between pre-test Vs post-test of group B

$\overline{x2}$ = mean difference between pretest Vs posttest of group B

S = combined standard deviation

V DATA ANALYSIS

TABLE - I

BRUNNSTROM RECOVERY SCALE

UNPAIRED ‘t’ TEST - PRE-TEST VALUES OF GROUP A AND GROUP B

S. No	Group	Mean	Mean difference	Standard deviation	Unpaired ‘t’ value
1.	A	3.13	0.13	±0.92	0.348
2.	B	3.27			

The Table I shows the analysis of Brunnstrom recovery scale on unpaired ‘t’ test. The calculated ‘t’ value is 0.348 which is lesser than the table ‘t’ value is 2.048 at 5% level of significance and 28 degrees of freedom. This test showed that there was significant difference between Group A and Group B.

GRAPH I

BRUNNSTROM RECOVERY SCALE

UNPAIRED ‘t’ TEST - PRE-TEST VALUES OF GROUP A AND GROUP B

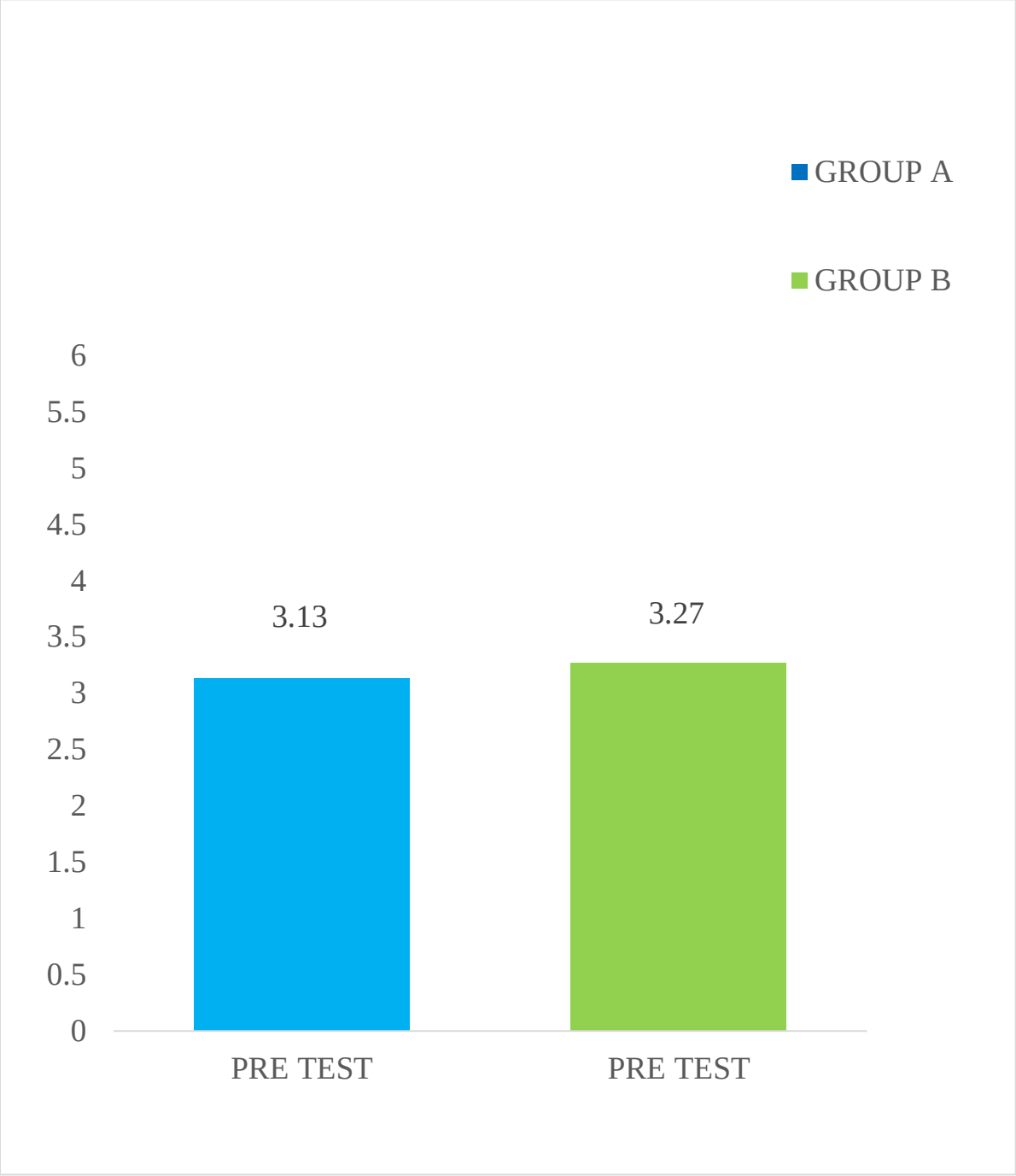

TABLE – II

BRUNNSTROM RECOVERY SCALE

PAIRED ‘t’ TEST - PRE-TEST AND POST-TEST VALUES OF GROUP A

S.no	Test	Mean	Mean difference	Standard deviation	Paired ‘t’ value	Percentile increase in BRS from initial value
1.	Pre test	3.13	1.07	±0.153	6.96	17.83%
2.	Post test	4.20				

The Table II shows analysis of Brunnstrom recovery scale in Group A. Using paired ‘t’ test with 14 degrees of freedom and 0.05% as a level of significance, the calculated ‘t’ value 6.96 is more than the tabulated ‘t’ value 2.145. The result shows that there was marked difference between pre-test and post-test values.

GRAPH II

BRUNNSTROM RECOVERY SCALE

PAIRED ‘t’ TEST - PRE-TEST AND POST-TEST VALUES OF GROUP A

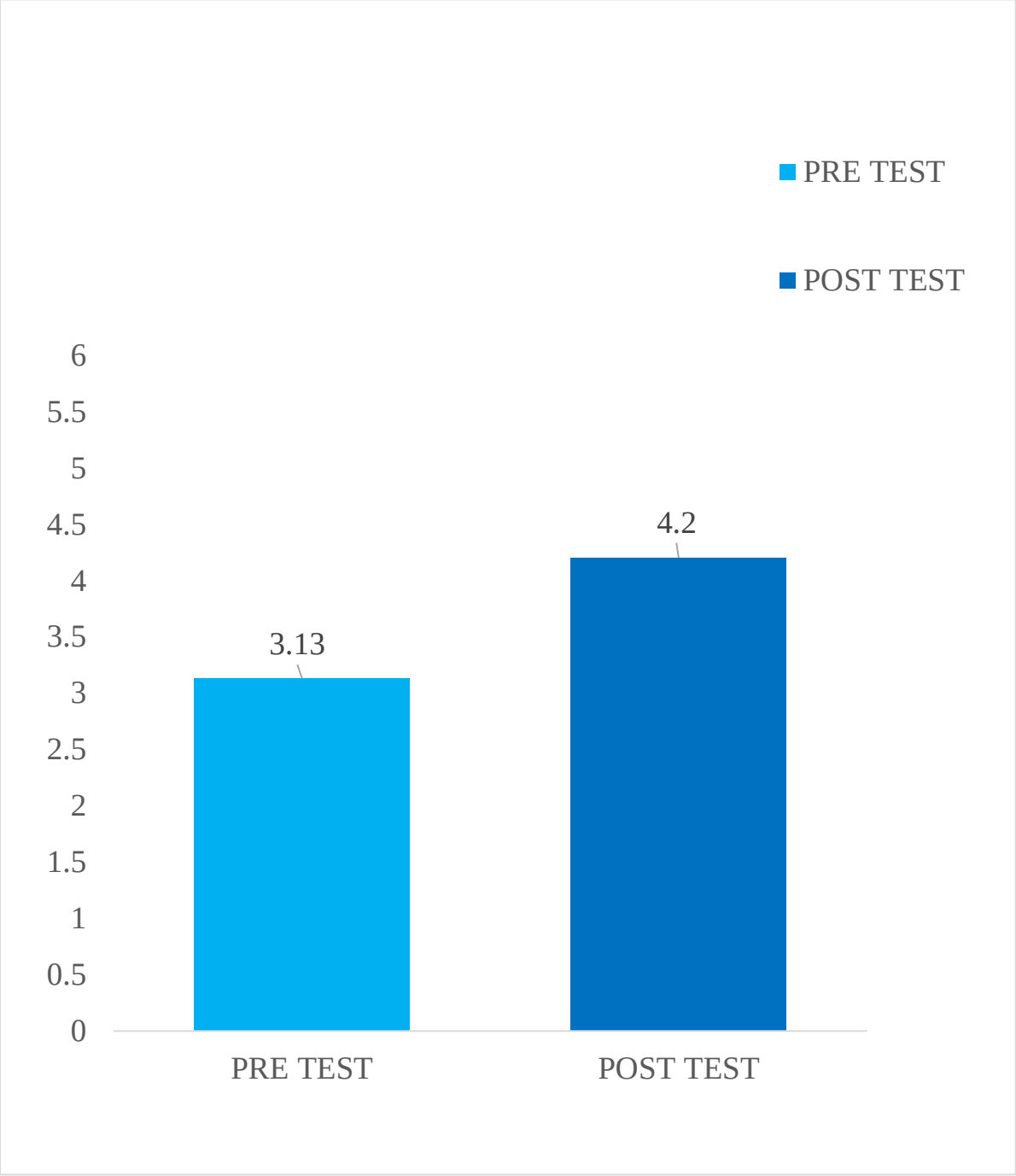

TABLE - III

BRUNNSTROM RECOVERY SCALE

PAIRED ‘t’ TEST - PRE-TEST AND POST-TEST VALUES OF GROUP B

S.no	Test	Mean	Mean difference	Standard deviation	Paired ‘t’ value	Percentile increase in BRS from initial value
1.	Pre test	3.27	1.80	±0.200	9.000	30%
2.	Post test	5.07				

The Table III shows analysis of Brunnstrom recovery scale in Group B. Using paired ‘t’ test with 14 degrees of freedom and 0.05% as a level of significance, the calculated ‘t’ value 6.96 is more than the tabulated ‘t’ value 2.145. The result shows that there was marked difference between pre-test and post-test values.

GRAPH III

BRUNNSTROM RECOVERY SCALE

PAIRED ‘t’ TEST - PRE-TEST AND POST-TEST VALUES OF GROUP B

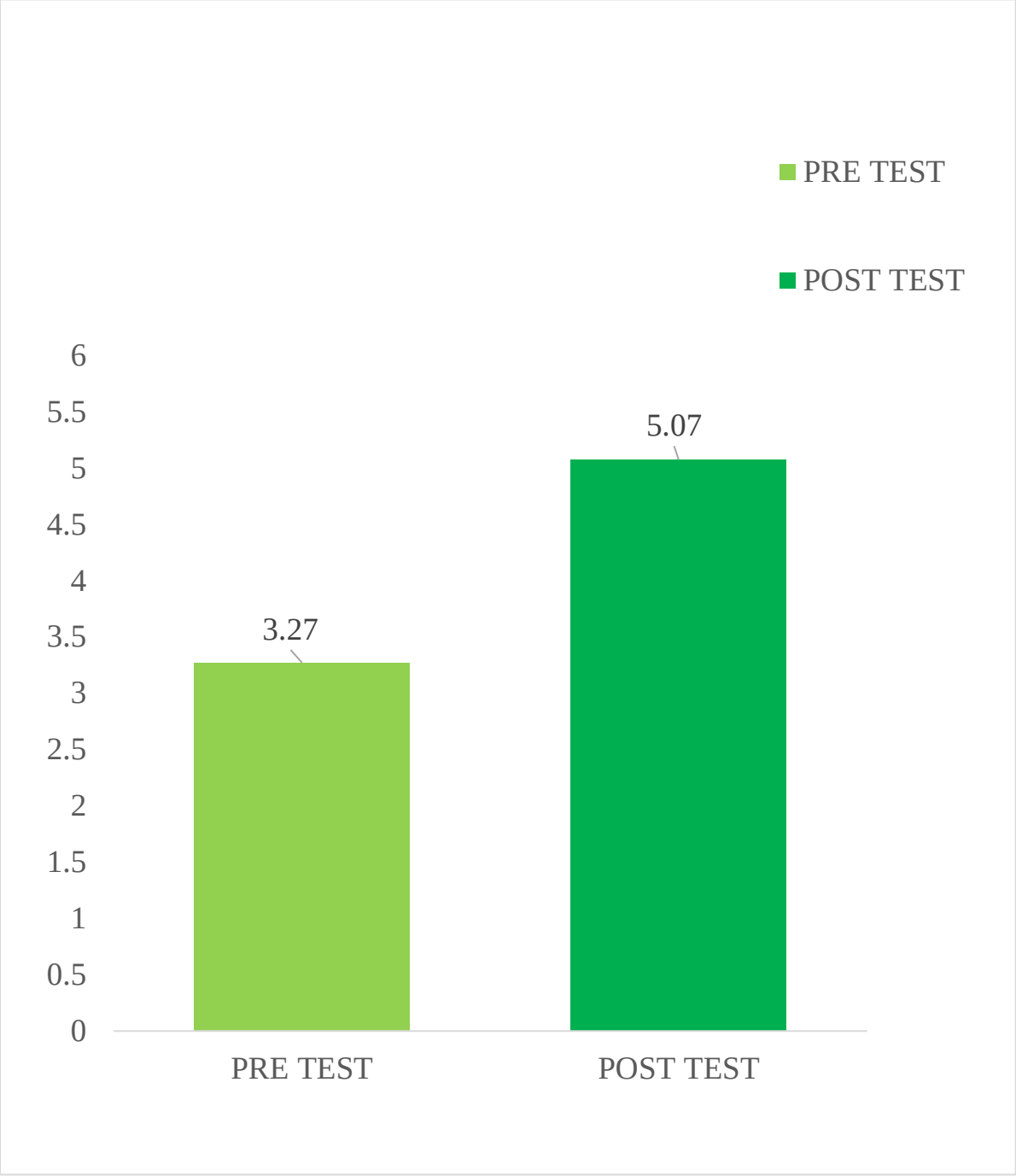

TABLE - IV

BRUNNSTROM RECOVERY SCALE

UNPAIRED ‘t’ TEST - POST-TEST VALUES OF GROUP A AND GROUP B

S.no	Group	Mean	Mean difference	Standard deviation	Unpaired ‘t’ value
1.	A	4.20	0.87	±0.303	2.86
2.	B	5.07			

The Table IV shows the analysis of Brunnstrom recovery scale on unpaired‘t’ test. The calculated ‘t’ value is 2.86 which is greater than the table ‘t’ value is 2.048 at 5% level of significance and 28 degrees of freedom. This test showed that there was significant difference between Group A and Group B.

GRAPH IV

BRUNNSTROM RECOVERY SCALE

UNPAIRED ‘t’ TEST - POST-TEST VALUES OF GROUP A AND GROUP B

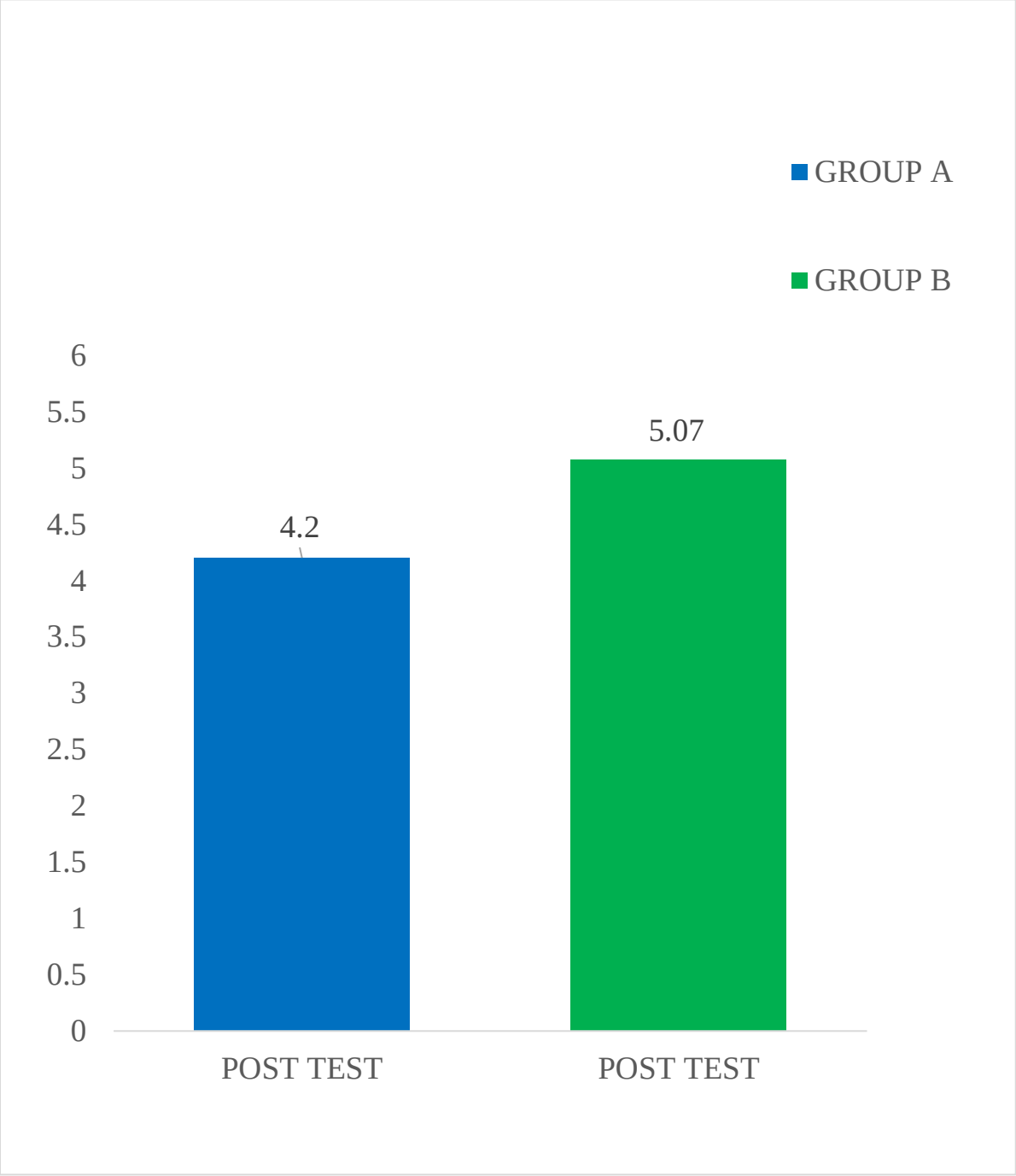

TABLE - V

SIMPLE TEST FOR EVALUATION OF HAND FUNCTION

UNPAIRED ‘t’ TEST - PRE-TEST VALUES OF GROUP A AND GROUP B

S.no	Group	Mean	Mean difference	Standard deviation	Unpaired ‘t’ value
1.	A	43.07	1.80	±3.32	0.720
2.	B	41.27			

The Table V shows the analysis of simple test for evaluation of hand function on unpaired ‘t’ test. The calculated ‘t’ value is 0.720 which is lesser than the table ‘t’ value is 2.048 at 5% level of significance and 28 degrees of freedom. This test showed that there was significant difference between Group A and Group B.

GRAPH V

SIMPLE TEST FOR EVALUATION OF HAND FUNCTION

UNPAIRED ‘t’ TEST - PRE-TEST VALUES OF GROUP A AND GROUP B

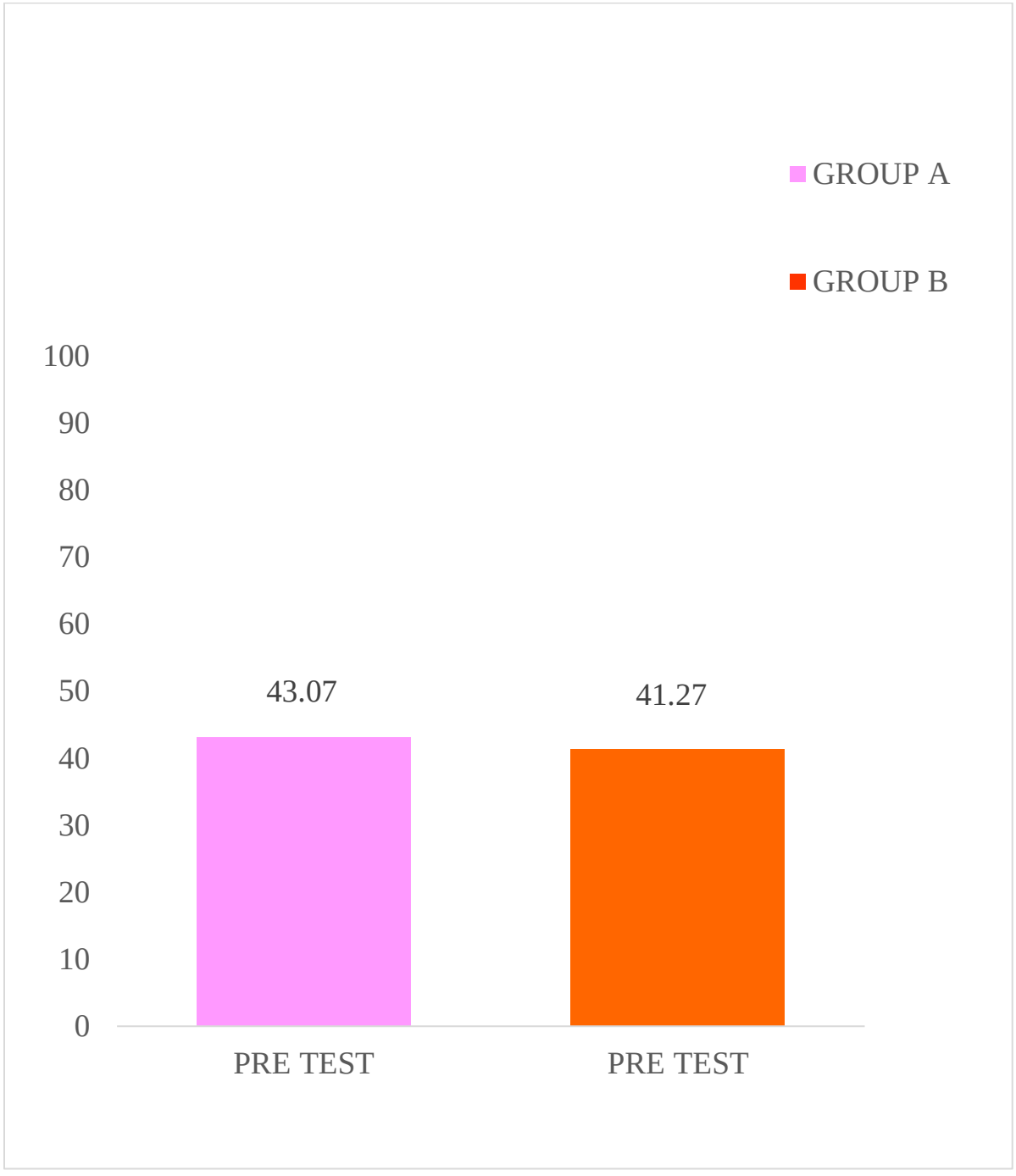

TABLE - VI

SIMPLE TEST FOR EVALUATION OF HAND FUNCTION

PAIRED ‘t’ TEST - PRE-TEST AND POST- TEST VALUES OF GROUP A

S.no	Test	Mean	Mean difference	Standard deviation	Paired ‘t’ value	Percentile increase in STEF from initial value
1.	Pre test	43.07	10.67	±1.076	9.91	10.67%
2.	Post test	53.73				

The Table VI shows the analysis of simple test for evaluation of hand function in Group A. Using paired ‘t’ test with 14 degrees of freedom and 0.05% as a level of significance, the calculated ‘t’ value 9.91 is more than the tabulated ‘t’ value 2.145. The result shows that there was marked difference between pre-test and post-test values

GRAPH VI

SIMPLE TEST FOR EVALUATION OF HAND FUNCTION

PAIRED ‘t’ TEST - PRE-TEST AND POST- TEST VALUES OF GROUP A

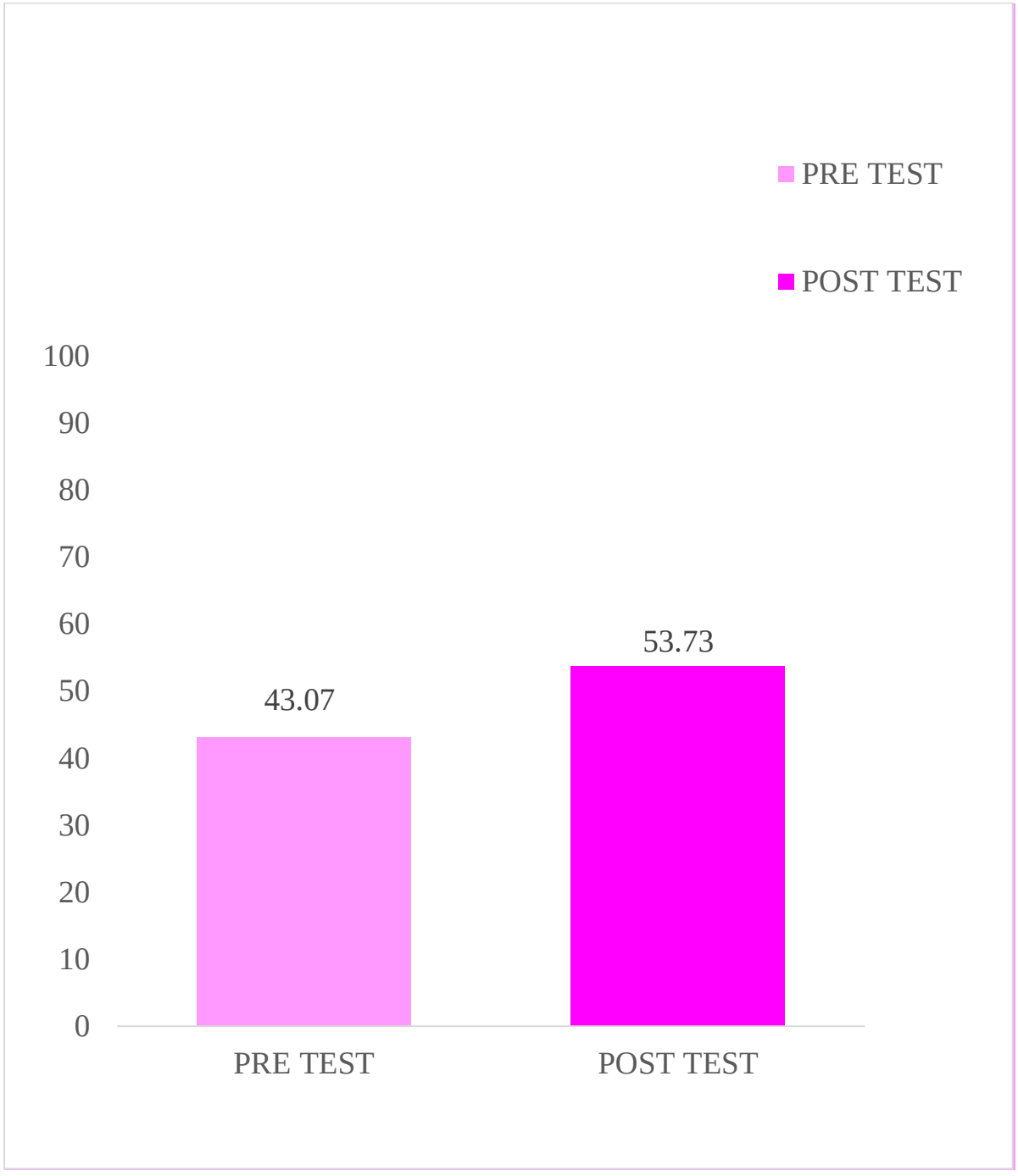

TABLE - VII

SIMPLE TEST FOR EVALUATION OF HAND FUNCTION

PAIRED ‘t’ TEST - PRE-TEST AND POST- TEST VALUES OF GROUP A

S.no	Test	Mean	Mean difference	Standard deviation	Paired ‘t’ value	Percentile increase in STEF from initial value
1.	PRE TEST	41.27	37.27	±1.248	29.87	37.27%
2.	POST TEST	78.53				

The Table VII shows the analysis of simple test for evaluation of hand function in Group A. Using paired ‘t’ test with 14 degrees of freedom and 0.05% as a level of significance, the calculated ‘t’ value 29.87 is more than the tabulated ‘t’ value 2.145. The result shows that there was marked difference between pre-test and post-test values.

GRAPH VII

SIMPLE TEST FOR EVALUATION OF HAND FUNCTION

PAIRED ‘t’ TEST - PRE-TEST AND POST- TEST VALUES OF GROUP B

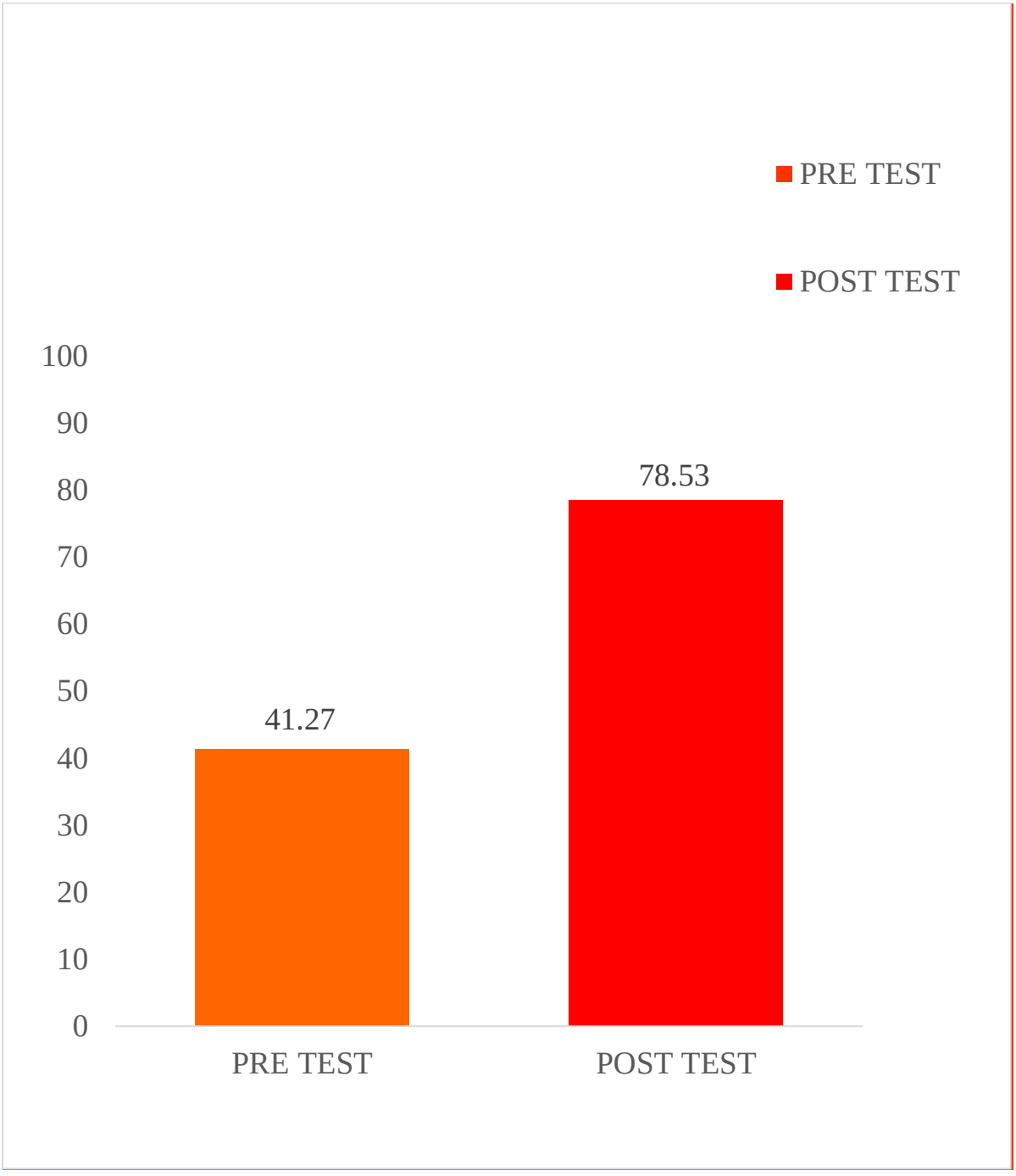

TABLE - VIII

SIMPLE TEST FOR EVALUATION OF HAND FUNCTION

UNPAIRED ‘t’ TEST - POST-TEST VALUES OF GROUP A AND GROUP B

S.NO	GROUP	MEAN	MEAN DIFFERENCE	STANDARD DEVIATION	UNPAIRED ‘t’ VALUE
1.	A	53.73	24.80	±3.123	7.94
2.	B	78.53			

The Table IV shows the analysis of simple test for evaluation of hand functions on unpaired ‘t’ test. The calculated ‘t’ value is 7.94 which is greater than the table ‘t’ value is 2.048 at 5% level of significance and 28 degrees of freedom. This test showed that there was significant difference between Group A and Group B.

GRAPH VIII

SIMPLE TEST FOR EVALUATION OF HAND FUNCTION

UNPAIRED ‘t’ TEST - POST-TEST VALUES OF GROUP A AND GROUP B

V DISCUSSION

After stroke, impairment of upper extremity functions leads to functional disability in post-stroke patients and increased dependency on caregivers. Remission of upper extremity functions takes place mainly in the first three months. Although this motor dysfunction is improved to some extent after rehabilitation training a large proportion (30%-60%) of patients left with persistent impairment of the upper limb movements and moderate to severe disability affects about 10% (Zhu L 2003 & Broeks JG 1999).

Hence this study was conducted to find out the effectiveness of moderate constraint induced movement therapy versus intensive repetitive facilitation exercises in post stroke patients. Primary outcome measures used were Brunnstrom recovery scale and simple test for evaluation of hand functions to measure the motor recovery of upper limb and hand respectively.

Statistical analysis of pre-test means of group A and group B reveal that there is no significant difference between two groups indicating that they are unmatched group of subjects undergoing different exercise program but were selected from the same population. Statistical analysis between pre-test and post-test values of group B at 5% level of significance showed significant improvement in Brunnstrom recovery scale and simple test for evaluation of hand functions following intensive repetitive facilitation exercises. Hence permits the rejection of null hypothesis.

Analysis results also showed there is an increase of about 30% in group B and 17.83% in group A in Brunnstrom recovery scale, there is an increase about 37.27% in group B and 10.67% in group A in simple test for evaluation of hand functions. This shows the superiority of intensive repetitive facilitation technique over modified constraint induced movement therapy.

Functional recovery of the hemi paretic upper limb and hand may depend on the repetition of voluntary movements elicited by the intensive repetitive facilitation exercises. Previous repetitive facilitation exercises cannot be done repetitively eg.100 repetition of each isolated movements of the upper limb and each finger which are under the influence of synergy patterns (Butefisch C-1995, Kawahira et.al., 2009). This novel intensive repetitive techniques gives sufficient focused physical stimulation to realize the patients intended movements.

Various components in the physical stimulation were stretch reflex, skin-muscle reflex, α-γ linkage induced by tapping or rubbing the muscles, rapid passive stretching of muscle or slight resistance against the intended movements. These stimulations were given sufficiently strong to induce the target movements when synchronized or three temporal combinations and postures of the stretched muscles. Which allowed direct elicitation of isolated movements of each finger, wrist & shoulder and combined movements of the shoulder, elbow, wrist and fingers which were free from synergy patterns.

Apart from that these methods are repeated smoothly for about 500-800 repetitions (100 repetition of each 5-8 patterns) within 40 minutes. This plays an important role in motor learning and also movements are done free from synergy patterns. Brain plasticity adds to the recovery of functions of upper limb and hand. When the voluntary movements are repeated by enhancing the excitability of motor cortex (Hummelsheim H et.al., 1995).

Therefore from this analysis it is stated that intensive repetitive facilitation is beneficial in improving motor functions of upper limb and hand.

VI SUMMARY AND CONCLUSION

This study compares the effectiveness of modified constraint induced movement therapy versus intensive repetitive facilitation exercise on motor recovery of upper limb and hand functions in stroke patients. In which the motor recovery of upper limb is measured by Brunnstrom recovery scale of arm and forearm and the motor function recovery of hand is measured by the simple test for evaluation of hand functions.

Group A subjects were given modified constraint induced movement therapy for 40 minutes a day for 5 days a week and the participants were advised to practice task training at home. For group B subjects were given intensive repetitive facilitation exercise for 40 minutes which includes 8 facilitation techniques for 5 days a week. Both the groups were given conventional therapy for about 15 minutes at the beginning and 5 mins cool down at the end of the session. The duration of exercise program was 8 weeks at the end of the 8^{th} week, motor functions of upper limb and hand was done again.

The results were analyzed using student ‘t' test. It showed that intensive repetitive facilitation exercises given to the group B proved to be more significant than modified constraint induced movement therapy in improving motor functions of upper limb and hand.

The analysis of results showed that intensive repetitive facilitation exercises improved motor functions of upper extremity and hand in patients with stroke. The exercise program is brief and simple. Risks are minimal in practice, the instructions are easy to follow and can be done at home after initial supervision by the therapist. This exercise program can be prescribed for sub-acute stroke patients whose upper limb motor functions are compromised.

VII. LIMITATIONS AND RECOMMENDATIONS

LIMITATIONS

1. The study consists of only 30 patients which is a small control group to expect precise results
2. Home monitoring of the rehabilitation program cannot be monitored through physiotherapists.
3. Duration of study is limited to include wide number of patients.
4. Patients anxiety increases due to the constraining of his unaffected arm which irritates the patient to do further exercises.
5. The interacting factors such as drug, psychosomatic factors and environment cannot be controlled.
6. The ADL movements practiced in constraint induced movement therapy is limited without much complex movements.

RECOMMENDATIONS

1. This study can be done with wide number of subjects.
2. The study duration can be increased so that proper prognosis in improving the motor functions of arm and hand can be analyzed.
3. This study can be stretched to various other types of stroke too.
4. This study can be done in subjects with different age group

5. Follow up of this study can be done.
6. Psychological counselling plus controlled environment can be included to avoid bias.

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APPENDIX-I

NEUROLOGICAL EVALUATION CHART

SUBJECTIVE ASSESSMENT

Name

Age

Sex

Occupation

Handedness

Date of assessment

Date of admission

Chief Complaints

Present medical history

Past medical history

Personal history

Occupational history

Family history

Socioeconomic status

Environmental history

Risk factors

Associated problems

Pain history

- Side
- Site
- Onset
- Duration
- Quality
- Intensity
- Aggravating factors
- Relieving factors

Vital signs

- Temperature
- Pulse rate
- Respiratory rate
- BP

OBJECTIVE ASSESSMENT

ON OBSERVATION

- Built
- Posture
- Attitude of limbs
- Muscle wasting

- Edema
- Involuntary movements
- Tropical changes
- Deformities
- Gait
- Pressure sores
- Respiration
- External appliances

ON PALPATION:

- Edema
- Tenderness
- Warmth

ON EXAMINATION:

Higher mental function

- Consciousness
- Orientation
- Attention
- Memory
- Communication
- Emotional status

Higher cortical function

Cognition

Perception

Mental Status Assessment

- Affect
- Mood
- Behavior
- Speech
- Thought process
- Thought content

Speech

- Sound production
- Articulation
- Understanding & Experiencing

Hearing

Vision

Cranial nerve examination

Sensory system

- Superficial sensation
- Deep sensation

- Combined Cortical sensation

Motor system

- Muscle tone
- Muscle girth
- Functional range of motion

Reflexes

- Superficial reflexes
- Deep reflexes
- Pathological reflexes

Voluntary movements

Involuntary movements

- Type
- Aggravating factors
- Limiting factors
- Quality

Balance

- Static balance
- Dynamic balance
- Balance reactions

Posture

- Lying
- Sitting
- Standing
- Gait

Hand functions

- Prehension
- Precision
- Hand grip
- Extension

Other systems

Musculoskeletal system

- Fracture
- Muscle contracture
- Joint stiffness
- Joint subluxation
- Osteoporosis
- Limb length discrepancy

- **Integumentary system**
- **Autonomic nervous system**
- **Bladder function**

- **Bowel function**

Functional assessment

ADL

Functional status

DIAGNOSIS

PT MANAGEMENT

Problem list

Short term & Long term goals

Means

APPENDIX-II

BRUNNSTROM RECOVERY STAGE FOR UPPER LIMB

MOTOR TEST-SHOULDER AND ELBOW

STAGE 1.

- ✓ No voluntary movements
- ✓ Limbs feel heavy
- ✓ Flaccidity

STAGE 2.

- ✓ Basic limb synergies appear
- ✓ Flexor synergy occurs before extensor synergy
- ✓ Spasticity develops in elbow flexors

STAGE 3.

- ✓ Basic limb synergies become stronger
- ✓ Flexor synergy tested by asking the patient to scratch behind the ear
- ✓ Extensor synergy is tested by asking patients to touch between the knees and hold together
- ✓ Usually synergies does not combine in stage 3.

STAGE 4

- ✓ Placing hand behind the body
- ✓ Elevation of the arm to a forward horizontal position

- ✓ Pronation-supination with elbow at 90.

STAGE 5

- ✓ arm raising to side horizontal position
- ✓ Arm raising forward and over head
- ✓ Pronation-supination with elbow extension

STAGE 6

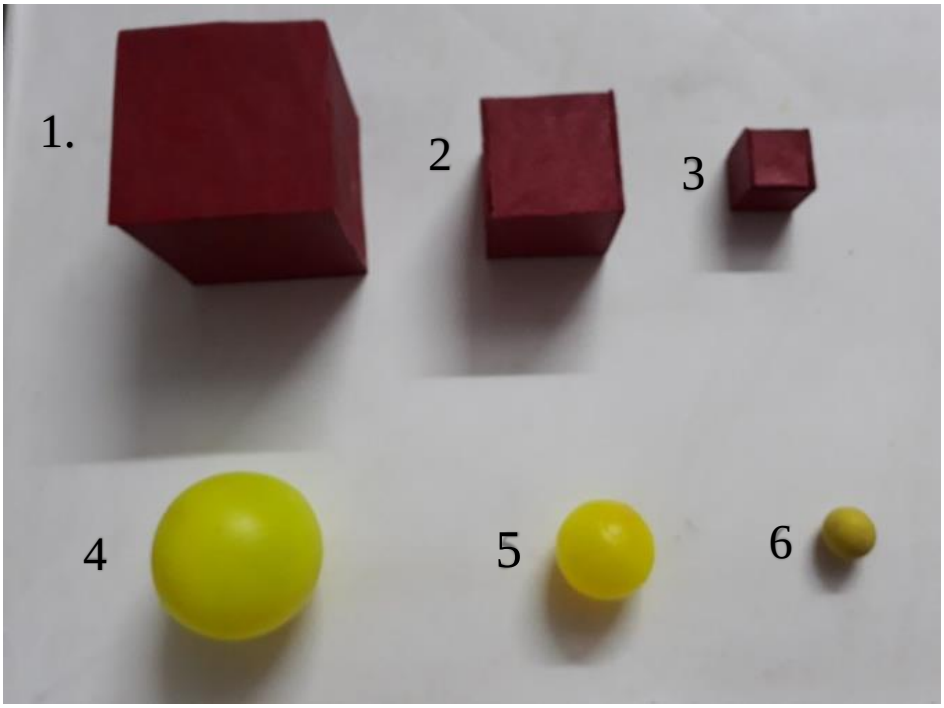
- ✓ isolated joint movements
- ✓ individual finger movements
- ✓ voluntary extension of digits

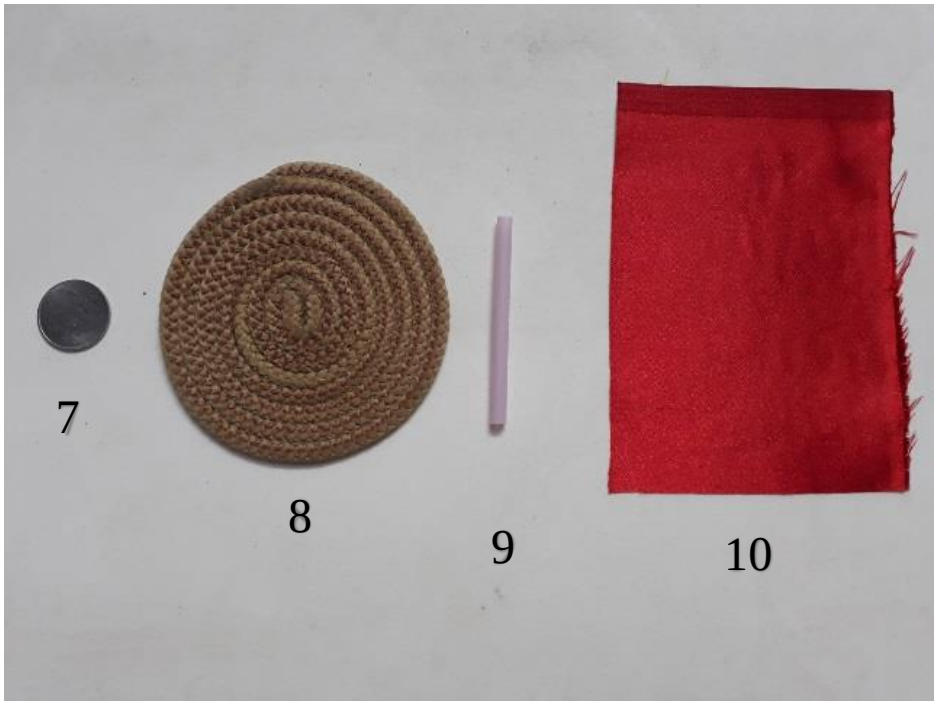
APPENDIX-III

SIMPLE TEST FOR EVALUATING HAND FUNCTIONS

Simple Test for Evaluating Hand Function (STEF). The STEF, which was developed in Japan, is a test for evaluating the patient's ability to pinch, grasp and transfer objects. The patient is required to pick up items one by one from a storage space and move them into a target space as quickly as possible. The subject performs the object-moving tests using 10 kinds of objects with different shapes and sizes

1. Six small size cubes
2. Six middle sized cubes
3. Five large cuboids
4. Six small balls
5. Six middle sized ball
6. Five large balls
7. Seven circular disc
8. Six wooden circular disks
9. Six pins
10. Six pieces of cloth

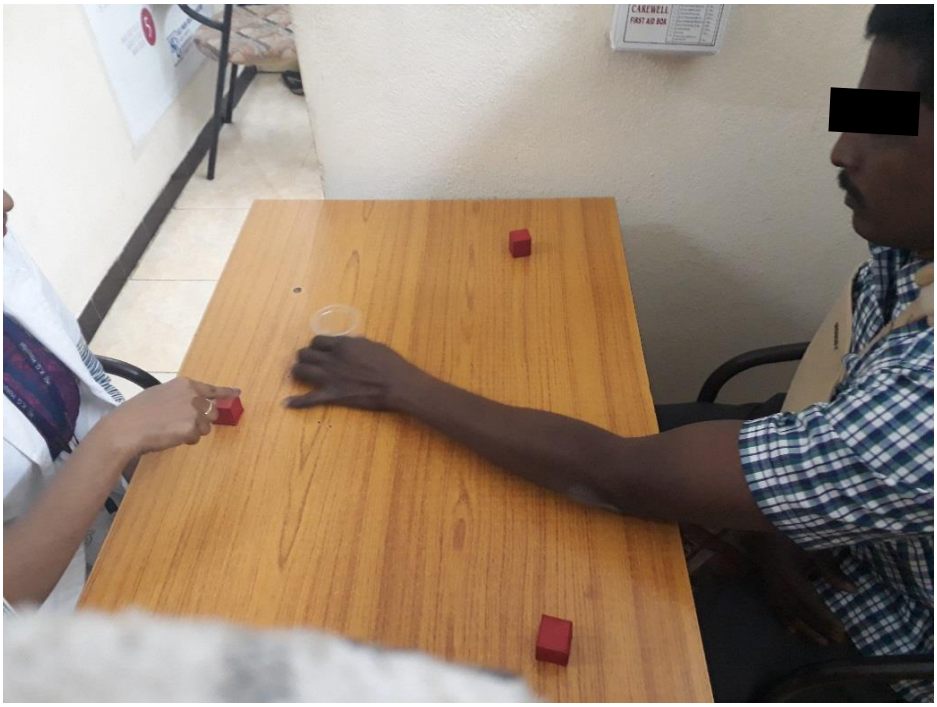




Scores were based on the time and metric distance taken to complete the task. Total of 10 tasks were asked to practice with 10 points to each score for a total of 100 points.

APPENDIX-IV

MODIFIED CONSTRAINT INDUCED MOVEMENT THERAPY



APPENDIX-V

INTENSIVE REPETITIVE FACILITATORY TECHNIQUE

i) Shoulder flexion with 90 elbow flexion in supine

ix. Shoulder horizontal extension /flexion with elbow flexion in supine

x. Shoulder flexion/adduction/external rotation with flexion of elbow and forearm accompanied by wrist flexion and shoulder extension/abduction/internal rotation while extending the elbow & pronating the forearm accompanied by wrist dorsiflexion and finger extension in supine

iv. Shoulder flexion/abduction/external rotation with elbow extension accompanied by wrist dorsiflexion and finger extension

v. Forearm supination/pronation with 90 elbow flexion

vi. Wrist dorsiflexion and fore arm pronation/supination with extension of fingers in sitting position

vii. Finger extension with wrist flexion in supination

viii. Finger extension/flexion with wrist flexion in the sitting position

APPENDIX-VI

ACTIVITIES OF DAILY LIVING

- Lifting cup
- Overhead activities
- Bottoming activities
- Screwing activities
- Picking up
- Cylinder holding

APPENDIX-VII

CONSENT FORM

This is to certify that I ---------- freely and voluntarily agree to participate in the study **"Effectiveness of trunk stabilization exercises on stable versus unstable surfaces in improvement of balance ability and gait of patients with moderate stroke."**

I have explained about the procedure and the risks that would occur during the study.

Participant:

Witness:

Date:

I have explained and defined the procedure to which the subject has consented to participate.

Researcher:

Date: